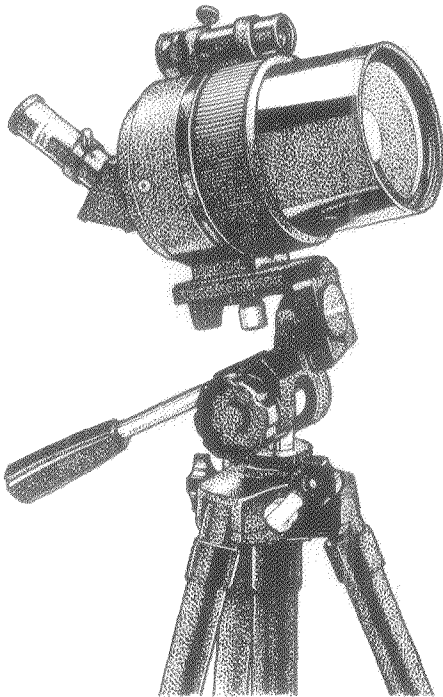


***CELESTRON***<sup>®</sup>



**SS80/C90 SPOTTING SCOPE**

---

**INSTRUCTION MANUAL**

---

---

**SPOTTING SCOPE  
INSTRUCTION MANUAL**

---

---

**THE SS80**

**THE C90**

---

## TABLE OF CONTENTS

---

<b>INTRODUCTION</b> .....	<b>1</b>
How to Use this Manual .....	1
A Word of Caution! .....	2
<b>GETTING STARTED</b> .....	<b>3</b>
Photographic Tripod .....	3
Mini Tripod .....	3
Car Window Mount .....	4
Shoulder Mount .....	4
Deluxe Photo Tripod Slow Motion Control .....	4
<b>THE SS80 SPOTTING SCOPE</b> .....	<b>5</b>
Removing the Lens Caps .....	6
Attaching the Standard Accessories .....	6
Using Your SS80 Visually .....	7
Focusing .....	7
Changing Eyepieces .....	8
Using Your SS80 Photographically .....	9
Attaching a Camera .....	9
Changing the Camera's Orientation .....	10
Focusing .....	10
Storing Your SS80 Spotting Scope .....	11
Technical Specifications .....	11
<b>THE C90 SPOTTING SCOPE</b> .....	<b>12</b>
Removing the Lens Caps .....	13
Attaching the Standard Accessories .....	14
Using Your C90 Visually .....	15
Focusing .....	15
Changing Eyepieces .....	15
Aligning the Finderscope .....	16
The Optional Lens Shade .....	16
Using Your C90 Photographically .....	17
Attaching Your Camera .....	17
Filters .....	18
Attaching a Video Camera .....	18
Storing Your C90 .....	19
Technical Specifications .....	19

<b>VISUAL OBSERVING INFORMATION .....</b>	<b>20</b>
Focusing .....	20
Figuring Magnification (Power) .....	21
Field of View .....	21
<b>PHOTOGRAPHY HINTS .....</b>	<b>22</b>
Metering .....	22
Reducing Vibration .....	22
<b>ASTRONOMICAL USES FOR YOUR SPOTTING SCOPE.....</b>	<b>23</b>
Observing the Sun .....	23
Observing the Moon .....	24
Observing the Planets .....	24
Observing Deep Sky Objects .....	25
Photographing the Moon .....	26
<b>CARE AND CLEANING OF THE OPTICS .....</b>	<b>27</b>

---

## INTRODUCTION

---

A spotting scope is nothing more than a telescope that is designed to look around the Earth. Unlike astronomical telescopes, which produce inverted or reverted images, spotting scopes produce correctly oriented images. Celestron offers many different models, each of which uses the highest quality optics to produce the best possible images. This manual covers the SS80 and the C90, two of the most compact spotting scopes on the market today. Both models have rugged, durable housings to give you a lifetime of pleasure with a minimal amount of maintenance.

---

### How to Use this Manual

This manual explains the proper use of your Celestron spotting scope — from initial set up to on-going use. Since this manual covers two spotting scopes, it is broken down into several sections. The first covers attaching your spotting scope to a stable platform, like a photographic tripod, so that the standard accessories can be attached. This procedure is identical for both the SS80 and the C90 and are, therefore, covered together.

The second section is on using your spotting scope. Topics include how to attach the standard accessories, how to locate objects, etc. Here the manual separates them by model. You need read only the section for your particular spotter.

The last four sections deal with general information that applies to both the SS80 and the C90. Topics include visual and photographic observing hints, astronomical uses for your spotting scope, and maintenance information. Before you attempt to use your spotting scope, read this manually carefully, especially the section that pertains to your spotting scope.

---

## A Word of Caution!

Your Celestron spotting scope is designed to give you hours of fun and rewarding observations. There are, however, a few things to consider before using your spotting scope that will ensure your safety and protect your equipment.

- **Never look directly at the Sun with the naked eye or with your spotting scope. Permanent and irreversible eye damage may result.**
- **Never use your spotting scope to project an image of the Sun onto any surface. Internal heat build-up can damage your spotting scope and/or any accessories attached to it.**
- **Never use an eyepiece solar filter or a Herschel wedge. Internal heat build-up inside your spotting scope can cause these devices to crack or break, allowing unfiltered sunlight to pass through to the eye.**
- **Never leave your spotting scope unsupervised, either when children are present or adults who may not be familiar with the correct operating procedures of your spotting scope.**
- **Never point your spotting scope at the Sun unless you have the proper solar filter. When using your spotting scope with the proper solar filter, ALWAYS cover the finderscope. Although small in aperture, this instrument has enough light gathering power to cause permanent and irreversible eye damage. In addition, the image projected by the finder is hot enough to burn skin and clothing.**

---

## GETTING STARTED

---

The high magnification of your spotting scope makes it very difficult to hand-hold and, as a result, must be attached to a stable platform. The SS80 and C90 both have a tripod adapter block which is located on the bottom of the spotting scope tube. Remove your spotting scope from the box and attach it to any of the mounts described below.

---

### Photographic Tripod

For best results, attach your Celestron spotting scope to a photographic tripod like the Celestron Photographic Tripod (#93596). To attach your spotting scope to the tripod:

1. Hold your spotting scope so that the tripod adapter block is over the 1/4x20 screw on the tripod head.
2. Thread the 1/4x20 screw on the tripod head into the tripod adapter block on the spotting scope.
3. Tighten the 1/4x20 screw fully to ensure the spotting scope does NOT come loose.

Once mounted on the tripod, you are ready to attach the standard accessories.

Following are descriptions of alternative mounts. The procedure for attaching your spotting scope to any of these is identical to that of the photographic tripod.

---

### Mini Tripod

The Celestron Mini Tripod (#93597) is a compact yet stable platform designed to sit on a flat, level surface for casual viewing. The base of the Mini Tripod is threaded so it can attach directly to a photographic tripod as well. This makes it easy to change from the Celestron Mini Tripod to a photographic tripod.

---

## **Car Window Mount**

In lieu of a photographic tripod, Celestron also offers a heavy-duty car window mount (#93513). This accessory clamps to a partially open window, making it easy to view from the comfort and safety of your car. The head is similar to those found on a standard photographic tripod which allows for smooth panning and vertical and horizontal adjustments. It is easy to use and fits in the glove compartment of your car.

---

## **The Shoulder Mount**

The Celestron Shoulder Mount (#94147) offers a sturdy way to hand-hold your spotting scope. The mount uses a shoulder rest to keep your spotting scope stable, yet free to follow or pan objects. This accessory is ideal for nature or sports observing.

---

## **Deluxe Slow Motion Control**

The Deluxe Photographic Tripod Slow Motion Control (#93804) is not a mount, but a fine pointing tool that fits between your spotting scope and the photographic tripod head. Unlike the rough adjustment handles found on photographic tripods, the Deluxe Photographic Tripod Slow Motion Control uses fine adjustment knobs to allow for precision pointing.

---

## **What next?**

With your spotting scope firmly attached to a stable platform, you are ready to attach the standard accessories and begin using your spotting scope. Please turn to the section for your particular spotting scope.



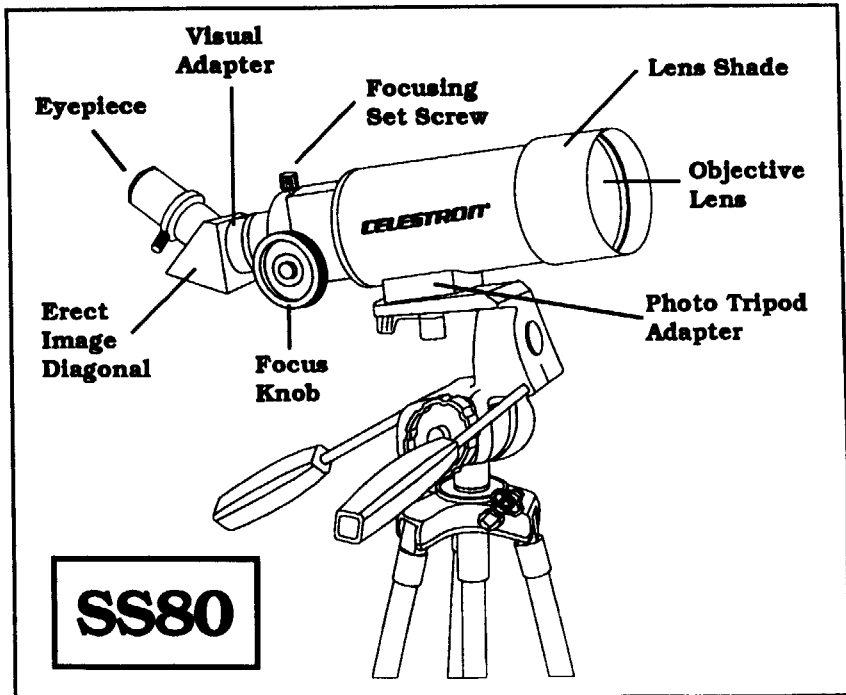
## THE SS80 SPOTTING SCOPE

This section covers the correct set up and operating procedures for your Celestron SS80 spotting scope and includes information on visual and photographic observations. The SS80 uses a classical refractor optical design with a two-element (achromatic) lens made of crown and flint glass. Unlike other spotting scopes which have built-in correcting prisms, the SS80 uses a diagonal to produce a correctly oriented image. This allows you to use your SS80 like a conventional telephoto when the camera is attached.

The SS80 comes standard with the following accessories:

- 18mm Orthoscopic Eyepiece 1-1/4" (22x)
- 45° Erect Image Diagonal 1-1/4"
- Photo Tripod Adapter
- Lens Caps
- Vinyl Carrying Case

Take a few minutes to study the diagram to help familiarize yourself with the various parts of your SS80 spotting scope for set up and ongoing use.



---

## Removing the Lens Covers

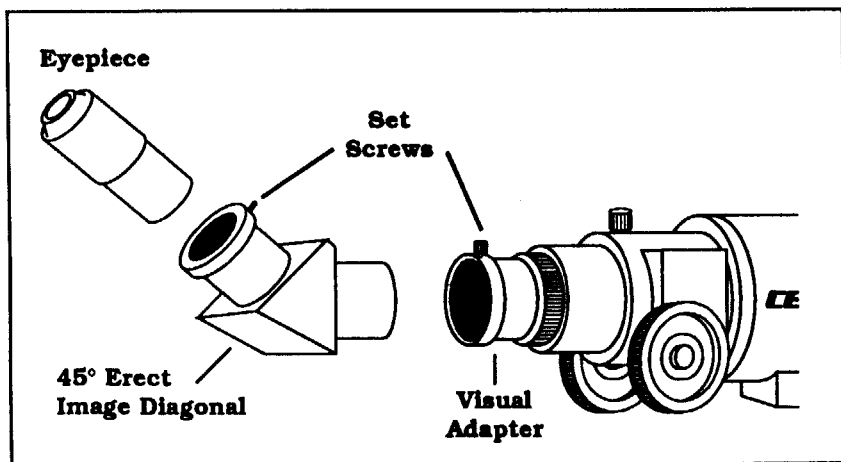
To protect your SS80, the objective lens, rear cell, and accessories are fitted with plastic covers. All are tension-fitted and easily removed by pulling away from the spotting scope. The covers should be removed as each piece is installed. Once removed, place the covers in the case to ensure they won't get lost.

---

## Attaching the Standard Accessories

With your SS80 attached to a sturdy mount, as described earlier in this manual, you are ready to attach the standard accessories. To do this:

1. Remove the plastic covers from the visual adapter of the spotting scope and from all the accessories.
2. Loosen the thumbscrew on the visual adapter (back of the spotting scope) so that the opening is unobstructed.
3. Slide the chrome end of the 45° Erect Image Diagonal into the visual adapter.
4. Tighten the thumbscrew on the visual adapter to hold the 45° Erect Image Diagonal in place.
5. Loosen the thumbscrew on the eyepiece holder of the 45° Erect Image Diagonal so that the inner diameter is unobstructed.



6. Insert the chrome portion of the eyepiece into the 45° Erect Image Diagonal.
7. Tighten the thumbscrew on the 45° Erect Image Diagonal to hold the eyepiece in place.

Your SS80 is now set up and ready to use.

---

### Using Your SS80 Visually

For your first look:

1. Point the SS80 at a distant object.
2. Sight along the tube to get in the general area of your target.
3. Look through the SS80 and center the target you selected.

The field of view is wide enough so that even casual pointing like this should get the object into the field. If it is not, sweep a little in each direction until the target is visible.

---

### Focusing

To focus, turn either of the focusing knobs (found on both sides of the SS80) until the image is sharp. To focus on a more distant object than the one you are currently observing, turn either of the focusing knobs away from the eyepiece. To focus on an object that is closer, turn either focusing knob toward the eyepiece.

**NOTE:** The reference to direction is described as if you were standing behind your SS80 spotting scope looking through the eyepiece.

---

## Changing Eyepieces

You can vary the power of your SS80 Spotting Scope simply by changing eyepieces (purchased separately). To change eyepieces:

1. Loosen the thumbscrew on the 45° Erect Image Diagonal.
2. Remove the eyepiece currently installed.
3. Insert the new eyepiece into the 45° Erect Image Diagonal.
4. Tighten the thumbscrew to hold the eyepiece in place.

With the new eyepiece in place you will need to focus your SS80 (unless you are using parfocal eyepieces). Once again, turn the focusing knob until the image is sharp.

The SS80 uses standard 1-1/4" diameter eyepieces. Celestron offers a wide variety of eyepieces as optional accessories. See the Celestron Accessory Catalog for a list of additional eyepieces. To determine the magnification of each eyepiece used with your SS80 Spotting Scope, see the section "Figuring Magnification" at the end of this manual.

The SS80 can be used without the 45° Erect Image Diagonal by inserting the eyepiece directly into the visual adapter. Keep in mind that all images viewed in this manner are inverted (i.e., upside down and backwards).

---

## Using Your SS80 Photographically

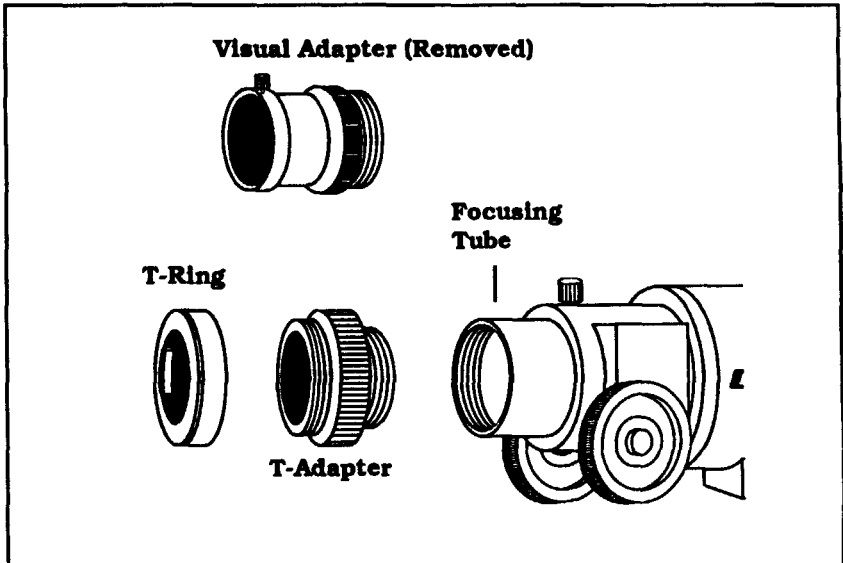
Your SS80 can be used photographically as well as visually. To turn your SS80 into a telephoto lens all you need is a Refractor T-Adapter (#93534) and a T-Ring designed for your particular camera make (i.e., Nikon, Minolta, Pentax, etc.). The T-Adapter threads directly onto the SS80. The T-Ring, which replaces the camera's normal lens, threads onto the T-Adapter.

---

### Attaching a Camera

To attach a camera to your SS80:

1. Remove all the visual accessories from your SS80.
2. Unscrew the visual adapter (i.e., the short metal tube with the set screw). This will leave the focusing tube exposed.
3. Thread the T-Adapter directly into the focusing tube.
4. Thread the T-Ring onto the T-Adapter until tight.
5. Couple the camera body to the T-Ring the way you would to any other lens.



---

## Changing the Camera's Orientation

If the camera is not oriented the way you want it (i.e., vertically or horizontally), you need to adjust the T-Adapter or T-Ring. To adjust the T-Adapter:

1. Loosen the slip ring on the T-Adapter.
2. Rotate the camera to the desired orientation.
3. Tighten the slip ring to hold the camera in place.

If the slip ring is too tight and can not be moved, you can change the camera's orientation by adjusting the T-Ring. To do this:

1. Locate the three small set screws on the T-Ring. They are spaced 120° apart.
2. Loosen the set screws with a small flat blade screwdriver (i.e., a jeweler's screwdriver). **Be sure you have a firm grip on the camera while loosening the set screws on the T-Ring.**
3. Rotate the camera to the desired orientation.
4. Tighten the set screws on the T-Ring to hold the camera in position.

Now, each time you attach your camera to the SS80 it will always be in this orientation. You can change the orientation any time using this procedure.

---

## Focusing

Once you have selected a target and centered it, turn the focusing knob until you achieve the sharpest possible focus. (The focusing mechanism is the same photographically and visually.) Once the camera has been focused, tighten the focusing set screw to secure the focus point. This will prevent the weight of the camera from pulling the focus tube out further, thus changing the true focus.

Due to the high magnification, the micro prism focuser in your camera may "black out." If this is the case, you will have to use the ground glass portion of your focusing screen, which itself may be dark. For the best results, take your time. Look at your subject

carefully to make sure that you have the sharpest possible focus. To achieve a very sharp focus, consider using a focusing magnifier. These devices are readily available from your local camera store.

If you can not get a sharp focus, check to see if your subject is closer than the near focus distance indicated in the "Technical Specifications" section.

**NOTE:** Due to the fast  $f$ /ratio of this lens, slow films should be used when shooting under normal, daylight conditions.

---

### Storing Your SS80 Spotting Scope

To minimize the need to clean your spotting scope, replace all lens covers after use. Your spotting scope can be left on a tripod for display purposes or returned to its carrying case. Since the rear cell is not sealed, the eyepiece or plastic cover should always be placed over the opening in the rear cell when not in use. This will prevent contaminants from entering the optical system.

---

### Technical Specifications

Below is pertinent technical information for your SS80 Spotting Scope that you may find useful.

Optical System:	Refractor (achromat)
Aperture:	80mm (3.15")
Focal Length:	400mm (16")
Near Focus:	
with standard eyepiece:	10'
with camera:	44'
Useful Power Range:	12x to 190x
Linear Field of View:	110'
Angular Field of View:	2.1°
F/ratio:	$f/5$
Length:	12.5"
Weight:	2 lb. 3 oz.

**NOTE:** All specifications are stated for the SS80 using the standard accessories. These specifications are approximate and may change without notice.

---

## THE C90 SPOTTING SCOPE

---

This section covers the correct set up and operating procedures for your Celestron C90 Spotting Scope and includes information on visual and photographic observations. The C90 Spotting Scope uses a combination of mirrors and lenses to produce an image. Such an optical system is known as a compound lens. This particular design, known as a Maksutov-Cassegrain, is one of the most compact and rugged optical systems on the market today. The basic C90 (#81010) comes standard with the following accessories:

- 30mm Eyepiece .96" (33x)
- 8x20 Erect Image Finderscope
- 45° Erect Image Diagonal .96"
- Photo Tripod Adapter Block
- Lens Caps
- Foam-Fitted Carrying Case

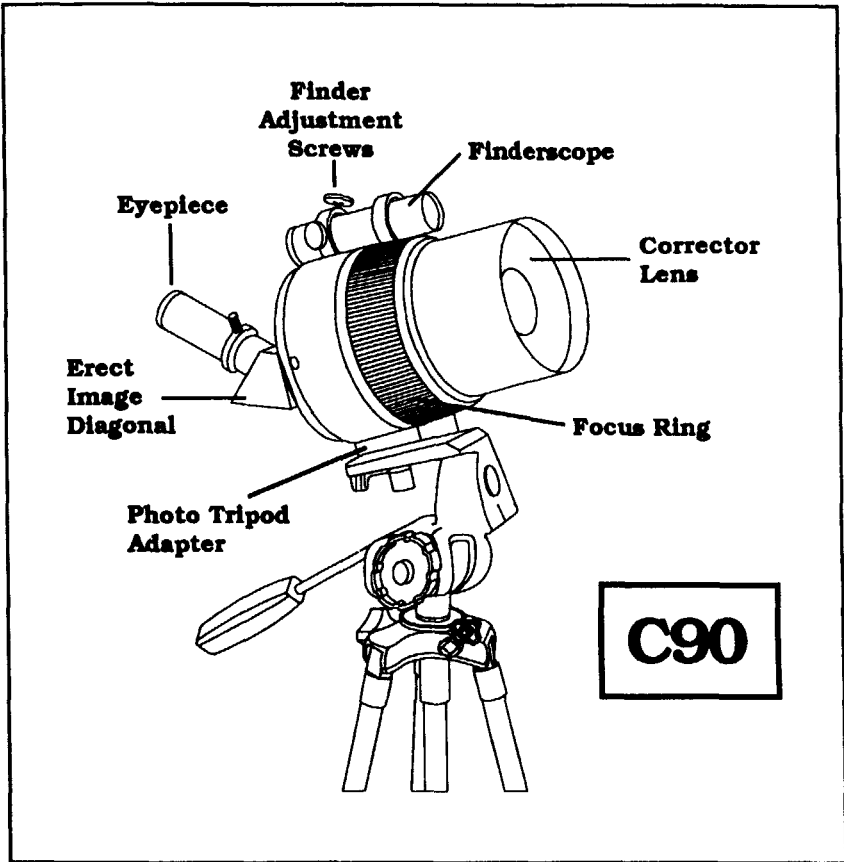
In addition to the basic C90, Celestron offers four additional models. Model #81011 includes all the standard accessories listed above but has multicoatings on both surfaces of the corrector lens. Model #81013 comes with the standard accessories listed above, has a multicoated corrector lens and is rubber covered. In addition, Celestron offers model #81025 and #81026 which include the following accessories:

- 30mm Ultima Eyepiece 1-1/4" (33x)
- 8x20 Erect Image Finderscope
- 45° Erect Image Diagonal 1-1/4"
- Photo Tripod Adapter Block
- Lens Caps
- Foam-Fitted Carrying Case

Both models have multicoated corrector lenses. Model #81025 has the standard finish while model #81026 is rubber covered.

Take a few minutes to study the diagram on the following page to help familiarize yourself with the various parts of your spotting scope for set up and ongoing use.





---

### Removing the Lens Covers

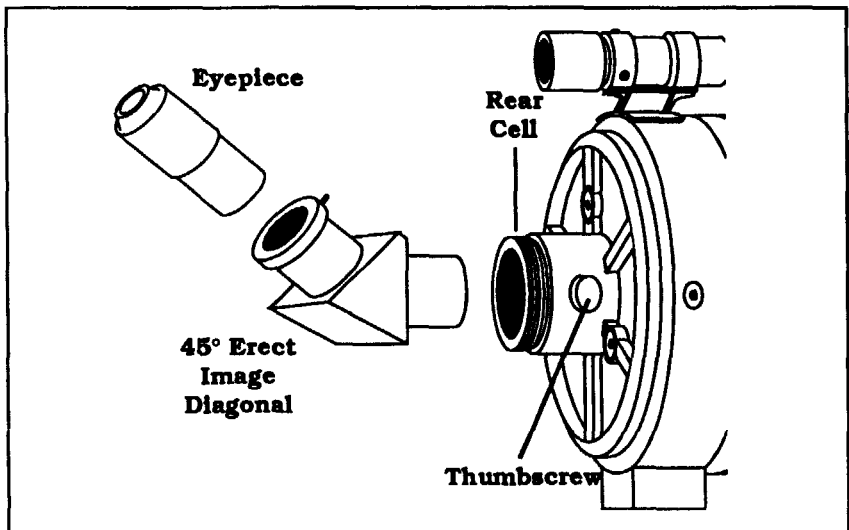
To protect your C90, the objective lens, rear cell, and accessories are fitted with plastic covers. All are tension-fitted and easily removed by pulling away from the spotting scope. The covers should be removed as each piece is installed. Once removed, place the covers in the case to ensure they won't get lost.

## Attaching the Standard Accessories

With your C90 attached to a sturdy mount, as described earlier in this manual, you are ready to attach the standard accessories. To do this:

1. Remove the plastic covers from the rear cell of the C90, the 45° Erect Image Diagonal, and the eyepiece.
2. Loosen the thumbscrew on the rear cell of the C90 so that the opening is unobstructed.
3. Slide the chrome end of the 45° Erect Image Diagonal into the rear cell.
4. Tighten the thumbscrew on the rear cell to hold it in place.
5. Loosen the thumbscrew on the eyepiece holder of the 45° Erect Image Diagonal. Make sure that it does not block the inner diameter of the eyepiece holder.
6. Insert the chrome portion of the eyepiece into the 45° Erect Image Diagonal.
7. Tighten the thumbscrew on the 45° Erect Image Diagonal to hold the eyepiece in place.

The installation method described here is the same for both .96" and 1-1/4" accessories.



---

## Using Your C90 Visually

With the standard accessories attached, you are ready for your first look.

1. Point your C90 at a distant object.
2. Locate the object in the finderscope. The finder is mounted and aligned at the factory.
3. Center the target on the cross hairs by adjusting the tripod.
4. Look through the C90 and center your target.

Repeat this process for each object you observe.

---

## Focusing

To focus, turn the rubber ring on the C90 tube until the image is sharp. On the rubber covered C90, turn the front portion of the lens to focus. For objects closer than the one you are currently observing, turn the focusing ring clockwise and for objects further away, turn counter-clockwise. The C90 has a tremendous amount of focus travel to allow for critical, sharp focusing.

---

## Changing Eyepieces

You can vary the power of your C90 Spotting Scope simply by changing eyepieces (purchased separately). To change eyepieces:

1. Loosen the thumbscrew on the 45° Erect Image Diagonal.
2. Remove the eyepiece currently in the spotting scope.
3. Insert a new eyepiece into the 45° Erect Image Diagonal.
4. Tighten the thumbscrew on the 45° Erect Image Diagonal to hold the eyepiece in place.

With the new eyepiece in place you will need to focus your C90 (unless you are using parfocal eyepieces). Once again, turn the focusing ring until the image is sharp.

The C90 can be used without the 45° Erect Image Diagonal by inserting the .96" eyepiece directly into the rear cell. Keep in mind that all images viewed in this manner are inverted (i.e., upside down and backwards).

Celestron offers a wide variety of eyepieces as optional accessories. To determine the magnification of each eyepiece used with your C90 spotting scope, see the section "Figuring Magnification" at the end of this manual.

In addition to eyepieces, you may also use a Barlow lens to increase magnification. A Barlow lens is a negative lens that increases the focal length of a spotting scope. Used with an eyepiece it will increase the magnification. The amount of the increase is dependent on the lens itself and its position in the optical system.

---

### Aligning the Finderscope

The C90 comes with an 8x20 finderscope to help you locate distant objects that might be overlooked in the narrow field of the main optics. The finder is attached and aligned at the Celestron factory. However, if the finder becomes misaligned, use the following procedure to align it:

1. Choose a target in excess of one mile away. This will eliminate any possible parallax effect.
2. Point the C90 at your target and center it in the main optics of the spotting scope.
3. Adjust the screws on the finderscope bracket until the cross hairs in the finder are centered on the target.
4. Tighten each screw a quarter of a turn so they will not come loose.

Accurate alignment of the finderscope makes it easy to find and center objects in your C90.

---

### The Optional Lens Shade

To reduce glare and improve contrast on very bright days, Celestron offers an optional lens shade. The unit threads into the front cell of the standard C90 models; it does not work on the rubber covered models.

---

## Using Your C90 Photographically

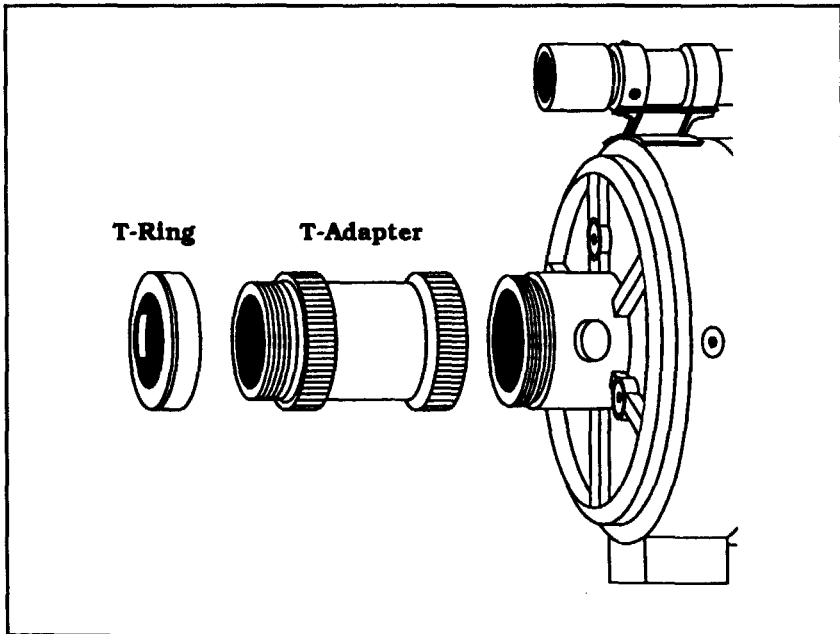
Your C90 can be used photographically as well as visually. To turn your C90 into a 1000mm telephoto lens all you need is a C90 T-Adapter (#93635) and a T-Ring for your particular camera make (i.e., Nikon, Minolta, Pentax, etc.). The T-Ring replaces the 35mm SLR camera's normal lens.

---

### Attaching a Camera

To attach a camera to your C90:

1. Remove all visual accessories.
2. Thread the T-Ring onto the T-Adapter.
3. Mount your camera body onto the T-Ring the same as you would any other lens.
4. Thread the T-Adapter onto the back of the C90 while holding the camera in the desired orientation (either vertical or horizontal).



---

## Focusing

The focusing mechanism is the same photographically and visually. However, due to the high magnification, the micro prism focuser in your camera may "black out." If this is the case, you will have to use the ground glass portion of your focusing screen, which itself may be dark. For the best results, take your time. Look at your subject carefully to make sure that you have the sharpest possible focus. To achieve a very sharp focus, consider using a focusing magnifier. These devices are readily available from your local camera store.

If you can not get a sharp focus, check to see if your subject is closer than the near focus distance listed in the "Technical Specification" section.

---

## Filters

Often it is desirable to use filters to increase photographic contrast. Celestron offers a set of Series V drop-in filters. The set consists of six ring-mounted glass filters that drop into the rear cell of the C90. The T-Adapter, which threads over the filter, holds it in place. The set includes a skylight (#1A), yellow (#8), yellow-green (#11), red (#25), blue (#80) and neutral density (#96).

---

## Attaching a Video Camera

The C90 can be adapted to a video or Super 8 movie camera by using the optional T-C 16mm Adapter (#93636) and the C90 T-Adapter (#93635). To attach a video camera to the C90:

1. Remove all accessories from the C90.
2. Remove the video camera's normal lens.
3. Thread the narrow end of the T-C 16mm adapter into the video camera.
4. Thread the wide end of the T-C 16mm Adapter onto the T-Adapter.
5. Thread the T-Adapter onto the C90 while holding the camera in the horizontal position.

Due to the weight of some video cameras, you may need additional support.

---

### Storing Your C90

To minimize the need to clean your C90, replace all lens covers after use. The spotting scope can be left on a tripod for display purposes or returned to its carrying case. Since the rear cell of your C90 spotting scope is not sealed, the eyepiece or plastic cover **MUST** be placed over the opening in the rear cell when not in use. This will prevent contaminants from entering the optical system.

---

### Technical Specifications

Below is pertinent technical information on your C90 spotting scope that you may find useful.

Optical System:	Maksutov-Cassegrain
Aperture:	90mm (3.55")
Focal Length:	1000mm (40")
Near Focus:	
with standard eyepiece:	5'
with camera:	6'
Useful Power Range:	25x to 210x
Linear Field of View:	53'
Angular Field of View:	1.0° (1.5° with 1-1/4"
eyepiece)	
F/ratio:	f/11
Length:	11.75"
Weight:	3 lb. 4 oz.

**Note:** All specifications are stated for the C90 using the standard accessories. These specifications are approximate and may change without notice.

---

## VISUAL OBSERVING INFORMATION

---

Aside from the specific information on each spotting scope, there are a few things that apply to all instruments when observing visually.

---

### Focusing

Each Celestron spotting scope has a unique focusing system which was discussed in the section on that specific instrument. However, when working with any optical instrument, there are several focusing hints that will ensure that you get the sharpest possible image. The hints listed here are for visual observing and photography.

- Never look through glass. Glass found in household windows is optically imperfect and may vary in thickness from one location to the next. This inconsistency can and will affect the ability to focus your spotting scope. In most cases, you will not be able to achieve a truly sharp focus. In some cases, you may actually see a double image. This effect is more pronounced with compound (catadioptric) lenses, like the C90, than with refractive lenses.
- Avoid looking across or over objects that are producing heat waves. This includes asphalt parking lots on hot summer days or building rooftops. The turbulent air caused by these conditions makes it impossible to get a truly sharp focus.
- Avoid hazy skies, fog, and mist, all of which can make it difficult to focus, thus greatly reducing the amount of detail seen. Remember that no matter how good the optics of your instrument are, they can NOT perform to their fullest under adverse conditions.



---

## Figuring Magnification (Power)

You can change the magnification of your spotting scope simply by changing the eyepiece (also called an ocular). To determine the magnification with your spotting scope, simply divide the focal length of your spotting scope by the focal length of the eyepiece. In equation format, the formula looks like this:

$$\text{Magnification} = \frac{\text{Focal Length of Spotting Scope (mm)}}{\text{Focal Length of Eyepiece (mm)}}$$

For example, to determine the magnification of the C90 with a 10mm eyepiece, divide the focal length of the C90 (1000mm) by the focal length of the eyepiece (10mm). 1000 divided by 10 yields 100 power.

Although the power is variable, each instrument has a limit to the highest useful magnification. The general rule is that 60 power can be used for every inch of aperture. For example, in a 3.5" diameter spotting scope, such as the C90, the maximum useful magnification is 210 power. This is derived from multiplying 60 times 3.5. Although this is the maximum useful magnification, most observing is done in the range of 20 to 35 power for every inch of aperture.

---

## Field of View

Determining the field of view is important if you want to get an idea of the size of the object you are observing. To calculate the actual field of view, divide the apparent field of the eyepiece (supplied by the eyepiece manufacturer) by the magnification. In equation format, the formula looks like this:

$$\text{True Field (in degrees)} = \frac{\text{Apparent Field of Eyepiece}}{\text{Magnification}}$$

Using the example we started with in the previous section, we can determine the field of view using the same 10mm eyepiece. The 10mm eyepiece has an apparent field of view of 46°. Divide the 46° by the magnification, which is 100 power. This yields an actual field of .5°, or about half of a degree. To convert this to feet at one thousand yards, multiply the actual field of .5° by 52.4. This gives us a field width of 24 feet at one thousand yards.

---

## PHOTOGRAPHY HINTS

---

Aside from the specific information for each spotting scope listed in the appropriate section, there are some general photography hints that apply to all instruments.

---

### Metering

Celestron spotting scopes have fixed apertures and, as a result, fixed f/ratios. To properly expose your subjects photographically, you need to set your shutter speed accordingly. Most 35mm SLR cameras offer through-the-lens metering which lets you know if your picture is under or overexposed. Adjustments for proper exposures are made by changing the shutter speed. Consult your camera manual for specific information on metering and changing shutter speeds.

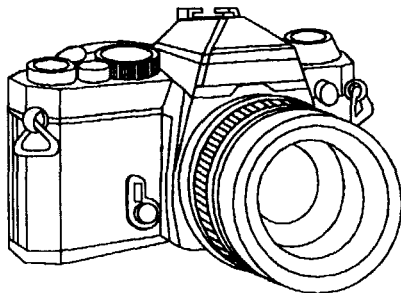
---

### Reducing Vibration

Releasing the shutter manually can cause vibrations, producing blurred photos. To reduce vibration when tripping the shutter, use a cable release. A cable release keeps your hands clear of the camera and lens, thus eliminating the possibility of introducing vibration. Mechanical shutter releases can be used, though air type releases are best.

Blurry pictures can also result from shutter speeds that are too slow. To prevent this, use films that produce shutter speeds greater than 1/250 of a second when hand-holding the lens. If the lens is mounted on a tripod, the exposure length is virtually unlimited.

Another way to reduce vibration is with the Vibration Suppression Pads (#93503). These pads rest between the ground and tripod feet. They reduce the amplitude and vibration time of your spotting scope when shaken by the wind or bumped accidentally.



---

## ASTRONOMY WITH YOUR SPOTTING SCOPE

---

A spotting scope is nothing more than a telescope that produces correctly oriented images. That is why all Celestron spotting scopes are so well-suited for looking around the Earth. But this in no way limits the spotting scope to terrestrial use. On the contrary, the SS80 and C90 spotting scopes work well as astronomical telescopes for observing the sky.

---

### Observing the Sun

Although overlooked by many amateur astronomers, solar observation is both rewarding and fun. However, because the Sun is so bright, special precautions must be taken when observing our star so as not to damage your eyes or your spotting scope. **Never project an image of the Sun through the telescope. Tremendous heat build-up inside the optical tube can damage the spotting scope and/or any accessories attached to the spotting scope.** To observe the Sun in complete safety, use the proper Celestron solar filter.

- For the C90 Rubber Covered use Solar Filter #94132
- For the C90 Standard use Solar Filer #94161
- For the SS80 use Solar Filter #94180

These filters reduce the intensity of the Sun's light, making it safe to view. With these filters you can see sunspots as they move across the solar disk as the Sun rotates. In addition, you can see tiny grain-shaped structures called granules, which are convection cells on the Sun. **Be sure to cover the lens of the finderscope when observing the Sun. This will ensure that the finderscope itself is not damaged and that no one looks through it accidentally.**

---

## Observing the Moon

In the night sky, the Moon is a prime target for your first look because it is extremely bright and easy to find. Often, it is tempting to look at the Moon when it is full. At this time, the face we see is fully illuminated and its light is overpowering. In addition, little or no contrast can be seen at this time.

One of the best times to observe the Moon is during its partial phases (around the time of first or third quarter). Long shadows reveal a wealth of detail on the lunar surface. At low power you can see the entire lunar disk at one time. Change to higher power (magnification) to focus in on a smaller area.

Keep in mind that since you are not using a clock drive, the Earth's rotation causes the Moon to drift out of your field of view. This effect is more noticeable at high power. You must manually adjust your tripod to keep the Moon centered. Consult your local newspaper or a current astronomy magazine to find out when the Moon is visible.

---

## Observing the Planets

This same method used to observe the Moon applies to viewing the planets. You can see Venus go through its lunar-like phases. Mars reveals a host of surface detail and one, if not both, of its polar caps. You will be able to see the cloud belts of Jupiter and the great Red Spot (if it is visible at the time you are observing). In addition, you will also be able to see the moons of Jupiter as they orbit this gas giant. Saturn, with its beautiful ring system, is easily visible at moderate power. All you need to know is when and where to look. Most astronomy publications tell where the planets can be found in the sky each month.

---

## Observing Deep Sky Objects

Deep sky objects are simply those objects outside the boundaries of our solar system. They include star clusters, planetary nebulae, diffuse nebulae, double stars, and other galaxies outside our own Milky Way. Because your spotting scope is not set up for serious astronomical observing, you will need to know where to look in the sky for these objects. The Celestron Sky Maps (#93722) will help you locate the brightest deep sky objects.

Once you start observing deep sky objects, there are a few things to remember. First, most deep sky objects have a large angular size. Therefore, low to moderate power is all you need to see them. Second, visually they are too faint to reveal any color that is common to photographs. Instead, they have a black and white appearance. And lastly, because of their low surface brightness, they should be observed from a dark sky location. Light pollution around large urban areas washes out most nebulae making them difficult, if not impossible, to see.

---

## Photographing the Moon

After looking at the night sky for awhile you may want to try photographing it. If you do, start with a nice, bright object like the Moon. To photograph the Moon:

1. Attach your spotting scope to a stable platform like the Celestron Photographic Tripod (#93596).
2. Load your camera with film that has a moderate-to-fast speed (i.e., ISO rating). Faster films are more desirable when the Moon is a crescent. When the Moon is full, and at its brightest, slower films are more desirable. If photographing during the full phase, use a yellow filter to reduce the light intensity and to increase contrast.
3. Center the Moon in the field of your spotting scope.
4. Set the shutter speed to the appropriate setting (see below).
5. Trip the shutter using a cable release so as not to shake the camera and spotting scope.

Lunar Phase	ISO 50	ISO 100	ISO 200	ISO 400
Crescent	1/2	1/4	1/8	1/15
Quarter	1/15	1/30	1/60	1/125
Full	1/30	1/60	1/125	1/125

The exposure times listed here should be used as a starting point. Always make exposures that are longer and shorter than the recommended time. Also, try bracketing your exposures, taking a few photos at each shutter speed. This will ensure that you will get a good photo.

Keep accurate records of your exposures. This information will be useful if you want to repeat your results or if you want to submit some of your photos to various astronomy magazines for possible publication!

---

## CARE AND CLEANING OF THE OPTICS

---

Occasionally, dust and/or moisture may build up on the objective lens of your spotting scope. Special care should be taken when cleaning any optical instrument so as not to damage the optics.

If dust has built up on the objective lens, remove the dust with a camel's hair brush or a can of pressurized air. Spray at an angle to the lens for approximately 2 to 4 seconds. Then use optical cleaning solution and white tissue paper to remove any remaining debris. Strokes should go from the center of the lens to the outer edge. **Do not rub in circles.**

When cleaning refractive lenses, like those in the SS80, do **NOT** spray the cleaning solution directly on the lens. Excess solution may seep between the air spaced elements of the objective lens. Instead, spray the solution onto the tissue and then proceed with cleaning the lens.

You can use commercially-made lens cleaner or mix your own. A good cleaning solution is isopropyl alcohol mixed with distilled water. The solution should be 60% isopropyl alcohol and 40% distilled water. Or liquid dish soap diluted with water (a couple of drops per one quart of water) can be used.

Internal adjustments and cleaning should be done only by the Celestron repair department. If your spotting scope is in need of internal cleaning, please contact the factory for service.

### **More...**

Celestron offers an extensive array of spotting scope accessories. Consult the Celestron Accessory Catalog (#93685-91) for details.

# CELESTRON LIMITED WARRANTY

## CELESTRON PRODUCTS

Celestron International (CI) warrants that each Celestron brand telescope, spotting scope and binocular shall be free from defects in materials and workmanship for its usable lifetime. CI will repair or replace such product or part thereof which, on inspection by CI is found to be defective in materials or workmanship. As a condition to the obligation of CI to repair or replace such product, the product must be returned to CI together with proof-of-purchase satisfactory to CI.

## RETURN AUTHORIZATION ALL PRODUCTS

The Proper Return Authorization Number must be obtained from CI in advance of return. Call the Consumer Toll-Free Line at 1-800-421-1526 to receive the number to be displayed on the outside of your shipping container.

All returns must be accompanied by a written statement setting forth the name, address, and daytime telephone number of the owner, together with a brief description of any claimed defects. Parts or product for which replacement is made shall become the property of CI.

CI shall be responsible for all costs of transportation (excluding insurance) in the event the product is returned no later than one year following the first retail purchase. Thereafter, the customer shall be responsible for all costs of transportation and insurance, both to and from the factory of CI, and shall be required to prepay such costs.

## ACCESSORIES/ELECTRONIC COMPONENTS

CI warrants that all CI accessories and electronic components shall be free from defects in materials and workmanship for one year from the date of sale to the first retail purchaser. The warranties set forth in this paragraph shall be the exclusive warranties provided by CI with respect to CI accessories and electronic features and shall be deemed to limit the obligation of CI under any other provisions of this warranty.

## WARRANTY

CI shall use reasonable efforts to repair or replace any product covered by this limited warranty within thirty days of receipt. In the event repair or replacement shall require more than thirty days, CI shall notify the customer accordingly. CI reserves the right to replace any product which has been discontinued from its product line with a new product of comparable value and function. In the event no product of comparable value and function is then marketed by CI, CI may, in lieu of replacement, pay the current fair market value of the product in serviceable condition.



This warranty shall be void and of no force or effect in the event a covered product has been modified in design or function, or subjected to abuse, misuse, mishandling or unauthorized repair. Further, product malfunction or deterioration due to normal wear is not covered by this warranty.

CI DISCLAIMS ANY WARRANTIES, EXPRESS OR IMPLIED, WHETHER OF MERCHANTABILITY OF FITNESS FOR A PARTICULAR USE, EXCEPT AS EXPRESSLY SET FORTH HEREIN.

THE SOLE OBLIGATION OF CI UNDER THIS LIMITED WARRANTY SHALL BE TO REPAIR OR REPLACE THE COVERED PRODUCT, IN ACCORDANCE WITH THE TERMS SET FORTH HEREIN. CI EXPRESSLY DISCLAIMS ANY LOST PROFITS, GENERAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES WHICH MAY RESULT FROM BREACH OF ANY WARRANTY, OR ARISING OUT OF THE USE OR INABILITY TO USE ANY CI PRODUCT. ANY WARRANTIES WHICH ARE IMPLIED AND WHICH CANNOT BE DISCLAIMED SHALL BE LIMITED IN DURATION TO A TERM OF ONE YEAR FROM THE DATE OF ORIGINAL RETAIL PURCHASE.

Some states do not allow the exclusion or limitation of incidental or consequential damages or limitation on how long an implied warranty lasts, so the above limitations and exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

CI reserves the right to modify or discontinue, without prior notice to you, any model or style optical instrument.

If warranty problems arise, or if you need assistance in using your CI product, contact:

**Celestron International  
Consumer Relations Department  
2835 Columbia Street  
Torrance, CA 90503  
310/328-9560**

**Toll-Free in Continental U.S.A.  
1-800-421-1526  
Monday-Friday 8AM-4PM PST**

This warranty supersedes all other product warranties.



**CELESTRON®**

2835 Columbia Street  
Torrance, CA 90503  
(310) 328-9560

Copyright 1992 Celestron International  
All rights reserved.

Products or instructions may change  
without notice or obligation.

Item # 93987-92  
02-93